ENVIRONMENTAL Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Landfill Design

Need for Landfills

In 1990, the New Hampshire Legislature adopted a hierarchy of preferred waste management methods which includes environmentally safe landfills. In descending order of preference, these methods are source reduction, recycling and reuse, composting, waste-to-energy, incineration and landfilling. Regardless of what solid waste management method is used, there will always be a residual product for which no use can be found. In New Hampshire the final resting place for these residuals is currently the double-lined landfill which is equipped with a leachate collection and leak detection system.

Concerns about Landfills

In the past, landfilling was not well controlled, with little attention paid to the siting, design and operation of landfills. As a consequence, many people become concerned about environmental and public health problems associated with landfills. These problems frequently include the following:

1) Precipitation infiltrating the landfill can leach contamination into the groundwater. This leachate can find its way into lakes and streams as well as public and private drinking water supplies, rendering these valuable resources useless, and in some cases, hazardous.

2) Decomposition of waste materials in the landfill produces methane gas. Methane can migrate through soil, away from the landfill where it can enter neighboring buildings. If it collects in sufficient concentration, methane can explode, resulting in loss of life and damage to property. In addition, landfills may emit gases to the atmosphere and affect air quality if not properly controlled.

3) Landfills attract a host of scavengers, many of which carry diseases. Large concentrations of these animals, including insects, birds and mammals, can be a threat to human health if not controlled.

4) When improperly covered, wastes at landfills may be carried off by wind, resulting in litter problems to the surrounding area. In addition, uncovered waste may produce odors and be a fire hazard, depending on the type of waste.

Landfill Design and Operation

The modern double-lined landfill is designed and operated to minimize the problems noted above. Design features of today's landfill include:

Primary impermeable liner and leachate collection system: This system collects the landfill leachate so that it can be treated and disposed in an environmentally sound manner.

Secondary impermeable liner and leachate collection system: This secondary system traps leachate which may leak through the primary liner. The secondary liner serves as an extra measure of safety and as a leak detection system for the primary liner.

Groundwater monitoring wells: The wells are used to detect leaks from the landfill and are vital in efforts to protect groundwater and surface water supplies from contamination. Groundwater monitoring wells provide a "third line of defense" beyond the primary and secondary leachate control systems to assure long-term security of the disposal area.

Gas venting and monitoring system: The purpose of this system is to control and monitor for potentially hazardous gas migrations.

Compaction and Grading: Because modern landfills are expensive to build and operate, available landfill space must be used to its fullest. As waste is dumped onto the landfill, it must be thoroughly compacted and graded according to engineered plans to conserve space, promote structural stability, provide drainage control and limit infiltration.

Daily cover: The landfill must be covered every day with soil or some other approved cover material. Daily cover discourages scavenging and limits the amount of disease bearing animals (vectors) at the landfill. Daily cover is also important to limit the amount of windblown litter, to reduce odor, and limit fire potential.

Intermediate cover: Areas of the landfill which are to remain inactive for extended periods of time must be covered with more soil than is used for daily cover in order to reduce the amount of rainfall infiltration into the waste, and also to minimize odors, scavenging, litter, and fire.

Final cover: When the landfill has reached its capacity, it must be covered with an impermeable soil or synthetic capping material, followed by a drainage layer designed to carry water away from the landfill, and finally a vegetative layer designed to stabilize slopes from erosion. The final cover serves as a stormwater management system that is intended to ultimately stop infiltration and thereby eliminate leachate production.

Post-Closure Monitoring

After the landfill has reached its capacity, stopped receiving waste, and the final cap has been placed, the landfill must be monitored for at least 30 years to make sure there are no leaks into the groundwater, unacceptable gas migration, excessive differential settlement, erosion of the final cap or any general instability or pollution hazard.

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